(19) **European Patent Office** (11) Publicn. No. **0 006 408**
B1

(12) **EUROPEAN PATENT**

(45) Date of publicn. of patent: **02/24/1982** (51) Int. Cl.: **A 61 F 1/00,** A 61 F 1/03

(21) Appl. No.: **78101483.2**

(22) Appl. date: **11/30/1978**

(54) Auxiliary element that can be inserted in a medullary cavity to assure the seating of an implant.

(30) Priority: **06/30/1978 DE 7819583 U**

(41) Date of publicn. of applicn.:
01/09/1980 Patent Bulletin 80/1

(45) Announcement of notice of issue of patent:
02/24/1982 Patent Bulletin 82/8

(84) Designated contracting states:
BE CH DE FR GB LU NL SE

(58) Prior art:
DE-A1-2 617 749
DE-B1-2 338 136
DE-U1-7 819 583
GB-A-1 409 053
GB-A-1 430 071

(71) Proprietor: **Howmedica International, Inc.**
Zweigniederlassung Kiel
Professor-Kuntscher-Strasse 1-5,
D-2301 Schonkirchen ub. Kiel(DE)

(72) Inventor: **Seidel, Hartmut**
Hochrad 19
D-2000 Hamburg 52 (DE);
Inventor: **Richter, Karl M**
Haferkemp 14,
D-2304 Wendtorf (DE);
Inventor: **Harder, Hans**
Erich, Mecklenberger
Strasse 32, D-2301
Probstelerhagen (DE)
Inventor: **Behrens, Klaus**
Am Sportplatz 8
D-2351 Rickling (DE)

(74) Representative: **Hauck, Hans, et al.,**
Mozartstrasse 23,
D-8000 Munich 2 (DE)

EP 0 006 408 B1

0 006 408

Auxiliary element that can be inserted in a medullary cavity to assure the seating of an implant.

The invention relates to an auxiliary element that can be inserted in a medullary cavity to assure the seating of implants.

Implants are often fixed in the medullary cavity by means of bone cement. There is however a danger that after a longer or shorter period of time the implant will loosen under the constant stress. This is in part caused by the implant not being effectively enough embedded in the bone cement, for there is a danger that due to the insertion of the implant the cement will migrate in the longitudinal direction of the bone, so that part of the bone cement does not contribute to the fixation of the implant.

A socket is known that can be inserted in a bone for the accommodation of the shaft of an implant, that has on its outer side anchoring means for the fixation in the bone cavity, and that is slit on the end turned away from the shaft of the implant (DE-B1-2 338 136). The socket has a hollow space for the accommodation of an expanding element with which the socket can be firmly anchored in the bone without the use of bone cement.

The invention is based on the problem of providing an auxiliary element to assure the seating of implants that guarantees an intimate connection between implant and bone cement on one hand and between bone cement and bone on the other.

This problem is solved according to the invention by means of a plug that can be inserted in the medullary cavity and constitutes the auxiliary element that retains the amount of bone cement necessary for the fixation of the implant and that has an anterior smooth section and a posterior flexible section that has greater cross-sectional dimensions than the anterior section and is provided with anchoring means to anchor the plug in the bone cavity.

The smooth section has approximately the diameter of the medullary cavity, while the posterior section has a somewhat larger diameter.

The plug in accordance with the invention is introduced into the medullary cavity first before the bone cement is fed in. The implant to be inserted then presses the bone cement laterally in the spongy part of the bone, with the plug preventing the migration of the cement in the longitudinal direction of the bone. In this way, by means of the cement, a solid non-porous connection results between bone and implant due to which the adhesion of the implant is raised considerably.

An especially effective anchoring of the plug in the medullary cavity is achieved with another embodiment of the invention, in which the anchoring means is formed from sawtooth-like circumferential ribs. The sawtooth shape of the ribs is however so arranged that the greater barb-like resistance takes place in the direction of insertion of the plug, while in the opposite direction it can be pulled out relatively easily. The difference between the auxiliary element according to the invention and the known socket can thus be particularly easily seen. The anchoring means on the socket is primarily to assure that the socket is not pulled out of the medullary cavity, while in the opposite direction a flange prevents further migration of the socket in the bone. It is also to be noted here that the invention plug is completely separate from the implant and during use there is more or less distance between the plug and the free end of the shaft of the implant. Whereas with the known socket the latter accommodates and supports the implant shaft directly, in the invention, the

plug serves to limit the migration of the bone cement in the direction of the medullary cavity.

According to another embodiment of the invention, it is provided that the posterior section widens conically towards the rear. To improve the flexibility of the posterior section it is provided, according to the invention, that the wall of the hollow posterior section has at least one longitudinal slot. According to another embodiment of the invention, in the anterior solid section of the plug a threaded hole is provided. An insertion tool can be engaged with the threaded hole, in order to anchor the plug in the medullary cavity at the desired depth.

According to yet another embodiment of the invention, a through-hole is provided in the solid anterior section. The through-hole serves to prevent the compressed medium being able to escape on insertion of the plug over the through-hole. The through-hole is however preferably kept so narrow that bone cement cannot pass through it in significant amounts.

An example of an execution of the invention is described in more detail below by means of drawings.

Fig. 1 shows the lengthwise view of a plug according to the invention;

Fig. 2 shows a section through the plug from Fig. 1.

The plug shown in Figs. 1 and 2, for example made of polyethylene, has an anterior section 10 made of solid material and a posterior section 11. The posterior section 11 is tapered in form with a conical blind hole 12 inside and sawtooth-shaped circumferential ribs 13 outside. In addition, four longitudinal slots 14 separated circumferentially at 90° intervals extend in the longitudinal direction through the wall of the posterior section 11.

The flanks between the ribs form an angle of about 60°. They are so arranged that a barb-like effect results when the plug is inserted into a medullary cavity in the insertion direction, i.e. with the anterior section 10 first. In the opposite direction, the upper flanks of the ribs 13 make a relatively smooth slide possible.

On insertion of the plug into a medullary cavity as in Figures 1 and 2, care is to be taken that the outside diameter of the anterior section 10, which is provided with a rounded edge 15 on the anterior surface, corresponds to the diameter of the medullary cavity. As a result, the four sections of the posterior section, separated by the slots 14, are bent radially towards the inside whereby the sawtooth-like ribs 13 are anchored effectively in the medullary cavity, so that on insertion of an implant the bone cement is prevented from migrating in the longitudinal direction of the bone and is pressed laterally into the spongy part of the bone.

For possible re-implantation, the plug shown is bored through with a twist drill or the like. With an extraction hook that grasps the end of the plug through the bored hole, the latter can be knocked out.

The drilled hole 12 is continued in the solid section 10 into a threaded hole 16 with which an insertion device can be engaged. In addition, or alternatively, the drilled hole 12 can also be provided with an inside thread, e.g. to extract the plug. The drilled hole 16 has a reduced diameter relative to the drilled hole 12. A through-hole 17 in the solid anterior section, of still smaller diameter, serves to compensate the pressure on insertion of the plug into the medullary cavity.

The plug shown has prototypical dimensions for a diameter of 12 mm. Normally, a series of inside diameters from 10 to 18 mm is sufficient to be correct for all situations that occur.

In the drawings, a plug with a solid anterior and a hollow flexible posterior part is shown. The invention is however not limited to this. Rather, the invention encompasses all plug-

like elements which, when inserted in a medullary cavity, prevent the migration of the bone cement in the longitudinal direction of the bone due to the resistance of the plug-like element.

Patent claims

1. Auxiliary element that can be inserted into a medullary cavity to assure the seating of implants, characterized by a plug which can be inserted into the medullary cavity and forms the auxiliary element, that holds back the amount of bone cement necessary for the fixation of the implant, and which has an anterior smooth section (10) and a posterior flexible section (11) that has greater cross-sectional dimensions than the anterior section (10), and is provided with anchoring means (13) for the anchoring of the plug in the medullary cavity.

2. Auxiliary element as in claim 1, characterized by the fact that the anchoring means is formed of sawtooth-shaped circumferential ribs (13).

3. Auxiliary element as in claim 1 or 2, characterized by the fact that the posterior section (11) widens conically towards the rear.

4. Auxiliary element as in one of the claims 1 to 3, characterized by the fact that the wall of the hollow posterior section (11) displays at least one longitudinal slot (14).

5. Auxiliary element as in one of the claims 1 to 4, characterized by the fact that a threaded hole (16) is provided in the anterior solid section (10).

6. Auxiliary element as in one of the claims 1 to 5, characterized by the fact that a through-hole (17) is provided in the anterior solid section (10).

FIG. 1

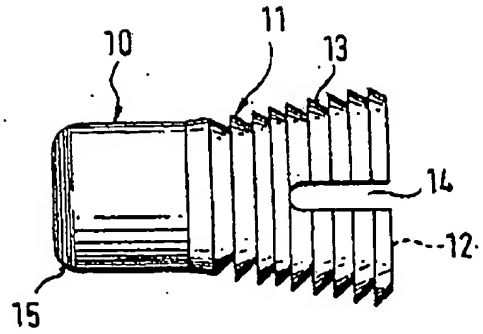

FIG. 2